

• • R E M A R K S •

The Official Action of December 17, 2002 has been thoroughly studied. Accordingly, the changes presented herein for the application, considered together with the following remarks, are believed to be sufficient to place the application into condition for allowance.

On page 2 of the Official Action the Examiner has noted that the specification is replete with terms which are not clear, concise and exact and has provided applicants with numerous examples of such terms. In addition, the Examiner has requested that applicants carefully revise the specification in order to ensure that it complies with 35 U.S.C. §112, first paragraph.

In response to the Examiner's request, applicants are herewith submitting a Substitute Specification under 37 CFR §1.125(b) together with a marked-up copy of the original Specification showing deleted text in brackets and added text underlined. In accordance with the requirements of 37 CFR §1.125(b) the undersigned attests that only those changes shown on the marked-up copy of the original specification have been made to the substitute specification and that no new matter has been added.

Entry of the Substitute Specification is respectfully requested.

The Abstract stands objected to. Under this objection the Examiner has noted several changes that needed to be made to the Abstract.

In response to the objection to the Abstract, the Abstract has been amended to incorporate the changes suggested by the Examiner.

On page 2 of the Official Action, the Examiner has objected to the drawings, noting changes to Figs. 2, 3, 5 and 8 which needed to be made.

In response to the objection to the drawings, applicants are submitting herewith under separate cover a Request for Approval of Drawing Amendments to which is attached photocopies of Figs. 2, 3 and 8 with proposed changes indicated in red ink.

The Examiner is requested to acknowledge receipt and approval of these proposed changes so that applicants can proceed with having corrected formal drawings prepared.

With regard to Fig. 5, the specification has been changed to indicate that this figure is not a partial cutaway view as in the case of Fig. 2.

On page 3 of the Official Action the Examiner has objected to the drawings under 37 CFR §1.83(a). Under this objection the Examiner has requested that the features set forth in claims 3, 6 and 8 be illustrated in the drawings.

With regard to claims 3 and 6, it is believed that the features recited in these claims are shown in Fig. 7.

With regard to claim 8, it is submitted that the "detachably attached" feature of this claim does not require separate illustration to convey an understanding (i.e. is not essential) of the subject matter. That is, such a drawing would not be significantly different from Fig. 6.

On page 3 of the Official Action the Examiner has objected to the disclosure due to a number of informalities which have been addressed in the Substitute Specification.

On page 3 of the Official Action the Examiner has objected to claim 4, 5, 7 and 8 due to a number of informalities which have been addressed in the amendments made herein to the claims.

Claims 1-8 stand rejected to under 35 U.S.C. §112, second paragraph. Under this rejection the Examiner noted several instances of language that rendered the claims indefinite.

It is believed that the changes made herein to the claims address and overcome this outstanding rejection.

Claims 1, 3, 4, 5 and 7 stand rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 2,788,003 to Morin.

Claims 3 and 6 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Morin in view of the American Heritage Dictionary definition of “grid” and U.S. Patent No. 3,430,630 to Megison et al.

Claims 1 and 8 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,022,210 to Glassman in view of Morin and U.S. Patent No. 5,514,120 to Johnston et al.

For the reasons set forth below, it is submitted that all of the pending claims are allowable over the prior art of record and therefore, each of the outstanding rejections of the claims should properly be withdrawn.

Favorable reconsideration by the Examiner is earnestly solicited.

The Examiner has relied upon Morin as teaching a cover 13, topsheet 11, core 12 and backing sheet 15. In reference to Morin the Examiner states:

See Figures, col. 1, lines 17-18, col. 2, lines 11-14 and 29-32, col. 3, lines 34-38 and 66-69, col. 4, 11-16 and 37-64 and claim 12 of Morin, i.e. cover is 13, topsheet is 11, core is 12 and backing sheet is 15.

Morin is directed to a disposable absorbent pad that comprises “a layer of inexpensive flocking absorbent material, such as fluffed woodpulp, covered with a relatively thin moisture permeable nonwoven web.”

As taught at column 1, lines 24-31:

✓  
The flocky absorbent material is stabilized and anchored to the nonwoven web through a pattern of spaced compressed strips of the material itself. These portions of the web overlying the compressed strips are held in close contact with the absorbent material in said strips; preferably being positively held in this position by an adhesive intermittently distributed in the web.

As taught at column 3, lines 26-34:

However, a flock material such as fluffed wood pulp, unless properly anchored, may present difficulties in an absorbent pad or diaper of this type, due to its tendency to break up and shift in position to form lumps and corresponding relatively empty areas of reduced absorptive capacity. Thus, some means must be found for anchoring the flocky fill to prevent it from breaking up and shifting in position during handling and use.

The “anchoring:”

...is accomplished in the present invention by compressing spaced narrow strips 17 of the absorbent layer through or against the facing sheet 11 by means of a hot embossing tool..

As can be seen, in each illustrated embodiment of the absorbent pad of Morin, the compressed strips or channels 17 extend across at least the longitudinal length of the pad.

Because the compression strips or channels 17 are taught as serving to anchor the flocky material and because Morin teaches that the flocky materials “must” be anchored, it is submitted that Morin requires that the compression strips or channels 17 extend completely across the longitudinal length of the pad. no

Otherwise, if the compression strips or channels 17 failed to extend across the longitudinal length of the pad, Morin teaches that the flocky material that would not be anchored (in the absence of compression strips or channels 17) and would break up and shift.

It is urged that Morin only teaches embodiments in which the compression strips or channels 17 extend across the entire longitudinal length of the pad, per Figs. 1 and 4-6.

Applicants' provide grooves that are only located at positions that improve air permeability and manage pressure that can occur when the absorbent core is pressed against the diaper wearer's body. These grooves, as depicted and claimed are not required to extend completely across the longitudinal length of the body fluid absorbent member.

In contrast to applicants' invention, Morin requires compression strips or channels 17 to extend across the entire longitudinal length of the pad in order to "anchor" the flocky material of the pad.

It therefore follows that Morin does not teach, anticipate or otherwise render applicants' invention obvious.

On page 5 of the Official Action the Examiner has relied upon the American Heritage Dictionary as defining "grid" and Megison as teaching that a grid encompasses interconnected lines.

The Examiner's reliance upon the American Heritage Dictionary and Megison does not address or overcome the differences between Morin and applicants' invention as presently claimed.

There is no motivation to modify Morin so that the compression strips or channels 17 do not extend to the longitudinal ends of the pad.

To the contrary, such a modification would do directly against and destroy the teachings of Morin and would be improper under the holding by the Board of Patent Appeals in *Ex parte Hartmann*, 186 USPQ 366 (PTO Bd App 1974) wherein the Board stated that:

References cannot properly be combined if effect would destroy invention on which one of reference patents is based.

In rejecting claims 1 and 8 over Glassman in view of Morin and Johnston et al. the Examiner has taken the position that:

To employ the grooves on both sides of the insert of Glassman et al instead of just one side would have been obvious....in view of the teachings of Morin and Johnston et al. due to the recognition that such would improve the distribution of moisture, i.e. more grooves for distribution, and Glassman's desire for such distribution as well as the interchangeability of channels on both sides for channels on one said as taught by Johnston et a.

Glassman teaches channels 25 on the "contacting" surface of the strip 17 to prevent puddling.

As discussed above, Morin teaches compression strips or channels 17 that serve as anchoring structures to prevent the flocky material from breaking up and shifting.

In Johnston et al. the microstructures or channels 22 are located in liquid management member 12 that is below a liquid permeable top sheet 14. The liquid management member 12 is a separate and distinct from the absorbent core 18.

Accordingly, Johnston et al. does not teach channels in an absorbent member.

It therefore follows that the combination of Glassman, Morin and Johnston et al, does not suggest or support the modification that the Examiner considers to be obvious. That is, the compression strips or channels 17 of Morin which are used as anchors have no use in Glassman. Moreover, the microstructures or channels 22 of Johnston et al. that are located in liquid management member 12 do not suggest including Glassman's channels 25 in both upper and lower surfaces of the absorbent layer.

Based upon the above distinctions between the prior art relied upon by the Examiner and the present invention, and the overall teachings of prior art, properly considered as a whole, it is respectfully submitted that the Examiner cannot rely upon the prior art as required under 35 U.S.C.

§102 as anticipating applicants' claimed invention. Moreover, it is submitted that the Examiner cannot properly rely upon the prior art as required under 35 U.S.C. §103 to establish a *prima facie* case of obviousness of applicants' claimed invention.

It is, therefore, submitted that any reliance upon prior art would be improper inasmuch as the prior art does not remotely anticipate, teach, suggest or render obvious the present invention.

It is submitted that the claims, as now amended, and the discussion contained herein clearly show that the claimed invention is novel and neither anticipated nor obvious over the teachings of the prior art and the outstanding rejection of the claims should hence be withdrawn.

Therefore, reconsideration and withdrawal of the outstanding rejection of the claims and an early allowance of the claims is believed to be in order.

The prior art made of record but not relied upon by the Examiner on page 7 of the Official Action have been noted. This prior art is not believed to be particularly pertinent to applicants' claimed invention.


It is believed that the above represents a complete response to the Official Action and reconsideration is requested.

If upon consideration of the above, the Examiner should feel that there remains outstanding issues in the present application that could be resolved, the Examiner is invited to contact applicants' patent counsel at the telephone number given below to discuss such issues.

To the extent necessary, a petition for an extension of time under 37 CFR §1.136 is hereby made. Please charge the fees due in connection with the filing of this paper, including extension of

time fees, to Deposit Account No. 12-2136 and please credit any excess fees to such deposit account.

Respectfully submitted,



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Marked-Up Copy of the Claims  
As Amended on March 17, 2003

1. (Twice Amended) A disposable diaper comprising:

a cover member having front and rear waist regions and a crotch region; and

a body fluid absorbent member attached to an inner [side] surface of said cover member;

said body fluid absorbent member extending in a longitudinal direction across said crotch region into said front and rear waist regions, said body fluid absorbent member having front and rear end portions that are fixed to the inner surface of said cover member at said front and rear end portions thereof,

said body fluid absorbent member including a liquid-pervious topsheet to be placed against a wearer's body, a backsheet to be placed against said inner surface of said cover member, and a body fluid absorbent core disposed between the liquid-pervious topsheet and said backsheet, said body fluid absorbent member being formed on a side facing said backsheet with at least one groove that is <sup>concave</sup> in a direction from said backsheet toward said [topsheet.] topsheet, said body fluid absorbent member having a longitudinal length that extend between and to the front and rear end portions and said at least one groove having a length that extends short of each of the front and rear end portions.

<sup>The</sup>  
3. (Twice Amended) ~~A~~ disposable diaper according to Claim 1, wherein said at least one groove comprises at least one first groove extending in said longitudinal direction across said crotch region into said front and rear waist regions and at least one second groove extending in a direction

orthogonal to the longitudinal direction so that said at least one first groove and said at least one second groove intersect one another and said at least one second groove extends to transversely opposite side edges of said body fluid absorbent member.

4. (Twice Amended) The disposable diaper according to Claim 1, wherein said body fluid absorbent member is formed on a side facing said topsheet with at least one [third] further groove that is concave in a direction from said topsheet toward said backsheet and extends in said longitudinal direction across said crotch region into said front and rear [trunk] regions.

5. (Twice Amended) The disposable diaper according to Claim 4, wherein said at least one [third] further groove is positioned to be substantially aligned with said at least one groove.

6. (Twice Amended) The disposable diaper according to Claim 3, wherein said body absorbent core is disposed between said backsheet which is formed with said at least one first groove and said at least one second groove therein and the topsheet opposed to said backsheet.

7. (Twice Amended) The disposable diaper according to Claim 4, wherein said body absorbent core is disposed between said topsheet which is formed with said at least one [third] further groove therein and the backsheet opposed to said topsheet.

8. (Twice Amended) The disposable diaper according to Claim 1, wherein said body fluid absorbent member is detachably [attached] fixed to said cover member.

Marked-Up Copy of the Abstract  
As Amended on March 17, 2003

[The] A disposable diaper that includes a cover member and a body fluid absorbent member attached to an inner side of the cover member. The absorbent member is composed of a liquid-pervious topsheet, a backsheet and an absorbent [core] member disposed therebetween. The core is formed on a side of the backsheet with at least one first groove concaved in a direction from the backsheet toward the topsheet.



Part of #9

MARKED-UP COPY OF SUBSTITUTE SPECIFICATION

DISPOSABLE DIAPER

5 BACKGROUND OF THE INVENTION

This invention relates to a disposable diaper for absorption and containment of excrement.

Japanese Patent Application Publication No. 1996-280739A describes a disposable diaper comprising a pants-shaped outer sheet and an absorbent panel attached to an inner surface of the outer sheet. The absorbent panel longitudinally extends across a crotch region of the outer sheet into front and rear waist regions. This absorbent panel comprises a liquid-pervious sheet, a liquid-impervious sheet and an absorbent member disposed between these two sheets. [With]  
10 When this disposable [diaper,] is worn by a wearer, the outer sheet which is elastically stretchable in a direction surrounding the wearer's waist region causes the absorbent panel to [be closely] fit close to the wearer's body.

Japanese Patent Application Publication No. 1996-38546A  
20 describes a pants-type disposable diaper provided on an inner side of the pants with an absorbent pad structure which longitudinally

extends across a crotch region of the pants into front and rear waist regions. This absorbent pad structure comprises a liquid-pervious topsheet, a liquid-impervious backsheet and an absorbent member disposed between these two sheets. [With] When this diaper is worn,  
5 elastically stretchable side sheets provided on the pants cause the absorbent pad structure to [be closely] fit close to the wearer's body.

In [the diaper] diapers that generally [comprising] comprise a pants-type cover member and a body fluid absorbent member attached  
10 to an inner side of the cover [member] member, like those described in the [Publication,] above Publications, the absorbent member has a liquid-pervious topsheet intended to be fit to a wearer's skin, a backsheet opposed to the topsheet and an absorbent core disposed between these two sheets wherein the backsheet is covered with the  
15 pants-type cover member. [With] When such a diaper worn, the pants-type cover member is pressed against the backsheet of the absorbent member which is thereby pressed against a wearer's skin. In this manner, the backsheet of the absorbent member is covered with the relatively thick pants-type cover member, so air permeability  
20 of the diaper may be reduced even if an air permeable and liquid-impervious sheet is used as the backsheet. As a result, the

wearer's skin against which this absorbent member is pressed may suffer from an uncomfortable stuffiness. Such a [trouble] problem may [be] occur not only with [the] a pants-type cover member but also with an open-type cover member.

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#### SUMMARY OF THE INVENTION

It is an object of this invention to provide [an improved air permeability to] a disposable diaper having improve air permeability which disposable diaper comprises [comprising] a cover member adapted  
10 to cover front and rear waist regions as well as a crotch region of a wearer's body, [body of the diaper] and an absorbent member adapted to be attached to an inner side of [this] the cover member.

According to this invention, there is provided a disposable diaper comprising a cover member composed of front and rear waist  
15 regions and a crotch region and a body fluid absorbent member attached to an inner side of the cover member.

In one embodiment of this invention, the body fluid absorbent member extends in a longitudinal direction [defined] across the crotch region into the front and rear waist [regions, having] regions and  
20 has front and rear end portions that are fixed to an inner surface of the cover member at the front and rear end portions [thereof.]

of the cover member. The body fluid absorbent member includes a liquid-pervious topsheet [includes to be] that is placed against the wearer's body, a backsheet [be] that is placed against the inner surface of the cover member and a body fluid absorbent core disposed between these two sheets. [The] A side of the absorbent core [is formed on a side of] facing the backsheet is formed with a plurality of [groove] grooves that are concaved in a direction extending from the backsheet toward the [topsheet and extending] topsheet. The grooves extend in one of the longitudinal direction and [the] a direction [being] that is orthogonal to the longitudinal direction.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view showing one embodiment of a disposable diaper according to this invention;

Fig. 2 is a partially cutaway plan view showing the disposable diaper as having been unfolded;

Fig. 3 is a sectional view taken along a section line III - III in Fig. 2;

Fig. 4 is a sectional view taken along a section line IV - IV in Fig. 2;

Fig. 5 is a sectional view taken along a section line V - V

in Fig. 2 that is not partially cutaway; [2;]

Fig. 6 is a sectional view taken along a section line VI - VI in Fig. 2;

Fig. 7 is a sectional view similar to that in Fig. 4 but showing another embodiment of this invention;

Fig. 8 is a plan view similar to that in Fig. 2 but showing still another embodiment of this invention;

Fig. 9 is a sectional view taken along a section line IX - IX in Fig. 8; and

Fig. 10 is an enlarged sectional view showing a part of Fig. 9.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Details of a disposable diaper according to this invention will be more fully understood from the description given hereunder with reference to the accompanying drawings.

A disposable diaper 1 shown in Fig. 1 in a perspective view is of a pants-type and comprises a pants-type cover member 2 adapted to cover a wearer's waist regions and crotch region, and a body fluid absorbent member 3 attached to an inner side of the cover member 2.

The cover member 2 is composed of a front waist region 6, a rear waist

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region 7 and a crotch region 8 positioned between these two waist regions 6, 7. The front and rear waist regions 6, 7 are overlaid upon and joined to each other along transversely opposite side edge portions 11, 12, [of them] at a plurality of joining zones 13 arranged  
 5 intermittently in a longitudinal direction of the diaper 1 along the respective side edge portions 11, 12. Such diaper 1 has a waist-opening 10a and a pair of leg-openings 10b of which respective peripheral edge portions are provided with elastic members 22, 23 (See Fig. 2 also) as indicated by chain lines.

10 Fig. 2 is a plan view of the diaper 1 in which the side edge portions 11, 12 connecting the front and rear waist regions 6, 7 to each other have been separated from one another [and then] with the diaper 1 [has] having been unfolded in opposite directions as indicated by arrows 14, 15 in Fig. 1. In the diaper 1 unfolded in this manner,  
 15 the cover member 2 has an hour glass shape and comprises an inner sheet 16 and an outer sheet 17 [of an hour glass shape] which are identical in shape as well as in size and which are intermittently bonded to each other by means of appropriate adhesive such as a hot melt adhesive or a welding technique. [Along longitudinally opposite  
 20 end portions 18, 19 of the front and rear waist regions 6, 7, respectively, and along transversely opposite side edge portions 21 of the crotch

region 8, of the cover member 2, elastic] Elastic members 22 associated with the waist-opening and elastic members 23 associated with the respective leg-openings are attached under tension to an inner surface of either of the inner sheet 16 or the outer sheet [17.] 17 along  
5 longitudinally opposite end portions 18, 19 of the front and rear  
waist regions 6, 7, and along transversely opposite side edge portions  
21 of the crotch region 8, of the cover member 2 respectively. The absorbent member 3 extends longitudinally across the crotch region 8 into the front and rear waist regions 6, 7 of the cover member 2  
10 and has front and rear end portions 26, 27, which are bonded to the end portions 18, 19 of the front and rear waist regions 6, 7 by means of a hot melt adhesive 28 (See Fig. [6]) 6). Alternatively, the front and rear end portions 26, 27 can be [or] detachably attached to [these] end portions 18, 19 by other means such as a pressure-sensitive adhesive  
15 or a mechanical fastener well known under the trade name of ["MAGIC TAPE".] MAGIC TAPE®. Transversely opposite side edge portions 29 of the absorbent member 3 extending between the front and rear end portions 26, 27 are provided with leak-barrier cuffs 31 which have openings toward a transversely middle zone of the absorbent member  
20 3. Elastic members 33 extending between the front and rear end portions 26, 27 are attached under tension to inner edge portions 32 of the

leak-barrier cuffs 31. The absorbent member 3 [is] is, as indicated by chain lines in Fig. [2] 2, formed on <sup>the top</sup> its backsheet 37 with a first groove [44] 41 (See Fig. 4).

Figs. [3 ~ 5] 3 through 5 are [respectively] sectional views  
 5 taken along section lines III - III, IV - IV and V - V extending in the transverse direction, respectively, in Fig. [2.] 2, with Fig. 5 not being cutaway as is Fig. 2. Referring to Fig. 3 [showing] which shows the diaper 1 in [the] a sectional view taken along the section line III - III extending across the crotch region 8 and bisecting  
 10 the diaper 1 into front and rear halves, the absorbent member 3 comprises a liquid-pervious topsheet 36 destined to contact with the wearer's skin, the previously described backsheet 37 which is preferably liquid-impervious and destined to contact with the inner sheet 16 of the cover member [2] 2, and a body fluid absorbent core 38 disposed  
 15 between the top- and backsheets 36, 37. The core 38 contains hydrophilic fibers 61 and superabsorbent polymer particles 62 and longitudinally extends toward the front and rear end portions 26, 27 of the absorbent member 3 [in] and has a rectangular shape. The top- and backsheets 36, 37 extend outwardly beyond a peripheral edge of the core 38 and  
 20 are joined together in a water-tight [by] manner using an appropriate adhesive or a welding technique. Along the opposite side edge portions

29 of the absorbent member [3,] 3 the backsheet [37] 37, which is joined with the topsheet [36] 36, extends outwardly beyond the side edges of the topsheet 36 and [these] the extensions of the backsheet 37 are folded inwardly in the transverse direction of the absorbent member 3 forming the respective leak-barrier cuffs 31. Portions of these leak-barrier cuffs 31 lying on the front and rear end portions 26, 27 of the absorbent member 3 are joined to these front and rear end portions 26, 27 using an adhesive 40 or a welding technique. In a [stale where] state in which the absorbent member 3 is longitudinally curved in a U-shape configuration (See Fig. 1), contraction of elastic members 33 associated with the leak-barrier cuffs 31 [makes] causes the leak-barrier cuffs 31 to rise and form openings 39 which are oriented toward the transversely middle zone of the absorbent member 3. In this transversely middle zone, the backsheet 37 is bonded to an inner surface of the cover member 2 by means of adhesive 30.

Now referring to Fig. 4 [showing] which shows the diaper 1 in [the] a sectional view taken along the section line IV - IV [extending aside toward] which is near to the rear waist region 7 [with respect to] than the line III - III [dividing] which divides the diaper 1 into front and rear sections as viewed in the longitudinal direction as indicated in Fig. 2, the absorbent member 3 is formed on the side

of the backsheet 37 with a pair of [the] first [groove] grooves 41 (See Fig. 4) [5)] that are concaved toward the topsheet 36 and extend longitudinally [extending] toward the front and rear end portions 26, 27. Each of the first [groove] grooves 41 preferably has a width of about 2 - 20 mm and a depth corresponding to about 1/4 - 3/4 of the thickness of the core 38, and each of the first grooves 41 has [its] an inner side that is lined with the backsheet 37. The core 38 is disposed between the backsheet 37 [defining] which defines the inner side of the respective first [groove] grooves 41 and the topsheet 36 which is opposed to the backsheet 36). The first [groove] grooves 41 [is] are intended to [maintain,] maintain clearance spaces between the absorbent member 3 and the member 2, which [clearances serving] clearance spaces serve to improve permeability of the diaper 1 even when these members 2, 3 are brought into a close contact.

Referring to Fig. 5 [showing] which shows the diaper 1 in [the] a sectional view taken along the section line V - V extending in the transverse direction along the end portion 19 of the cover member 2 as indicated in Fig. 2 (without the cutaway portion), the portions of the top- and backsheets 36, 37 extending outwardly beyond the peripheral edge of the core 38 are overlaid and bonded to the cover member 2 using an adhesive 42 or a welding technique. It is also

possible to attach these overlaying top- and backsheets 36, 37 in a detachable manner to the cover member 2 using an appropriate means such as pressure-sensitive adhesive.

Referring to Fig. 6 [showing] which shows the diaper 1 in [the]  
 5 a sectional view taken along the section line VI - VI extending between the front and rear end portions 18, 19 of the cover member 2 as indicated in Fig. 2, each of the first [groove] groove 41 is [laid] separated respectively in the crotch region 8 in the longitudinal direction by an appropriate spacing. If necessary, it is also possible to [make]  
 10 form all of the first [groove] grooves 41 [connected entirely,] so that they are connected and continuous, rather than [laying separately the respective first groove 41] being separated in the longitudinal direction. It should be understood [here] that, while the leak-barrier cuffs 31 are normally folded down onto the topsheet 36, [these] the  
 15 leak-barrier cuffs 31 are illustrated in Fig. 6 as being raised somewhat [rising] in order that the presence of these leak-barrier cuffs 31 <sup>is</sup> ~~can be~~ <sup>be</sup> ~~apparently~~ <sup>apparently</sup> ~~recognized.~~

[While] When the diaper 1 of such a structure is worn, the cover member 2 and the absorbent member 3 are maintained [to be spaced]  
 20 in a spaced apart relationship from each other along the first [groove] grooves 41 even when these members 2, 3 are brought into a close contact

with each [other and thereby] other. Accordingly, air permeability between the interior and the exterior of the absorbent member 3 can be improved. For example, an air permeable and liquid-impervious sheet may be used as a stock material for the backsheet 37 of the absorbent member 3 to ensure that a flow of air high in temperature and humidity can be guided from the interior of the core 38 through the backsheet 37 into the first [groove] grooves 41 and freely moved therein without being hindered by the cover member 2. With the inner and outer sheets 16, 17 of the cover member 2 being air permeable, a flow of air high in temperature and humidity introduced into the first [groove] grooves 41 can be exhausted therefrom into the exterior of the diaper 1.

Fig. 7 is a view similar to Fig. 4 but showing another embodiment of [this] the invention. The absorbent member 3 of this embodiment of the diaper 1 is formed with, in addition to the first [groove] grooves 41 extending in the longitudinal direction, a pair of second [groove] grooves 46 extending in the transverse direction, i.e., orthogonally to the first [groove] grooves 41, between the transversely opposite side edge portions 29 of the absorbent member 3. These second [groove] grooves 46 facilitate the flow of air high in temperature and humidity to be exhausted from the first [groove] grooves 41 and

thereby the air permeability of the absorbent member 3 is further improved. Preferably, one or more [pieces] portions of the second [groove] grooves 46 [with] having substantially the same [dimension] dimensional width and depth as the first [groove] grooves 41 [in width and depth] may [be installed against] intersect one [piece] portion of the first grooves 41.

Fig. 8 is a view similar to Fig. 2 but showing still another embodiment of [this] the invention, Fig. 9 is a sectional view taken along [a] the section line IX - IX in Fig. [2] 8 and Fig. 10 is an enlarged sectional view showing a [part] portion of Fig. 9. The diaper 1 shown in Figs. 8 - 10 has, in addition to the first [groove] grooves 41 or both the first and second grooves 41, 46 which are formed in the absorbent member 3 on the side of the backsheet 37 [36, a] third [groove] grooves 47 formed in the absorbent member 3 on the side of the topsheet 36 so as to extend in the longitudinal direction. Preferably, the absorbent member 3 is formed on the side of the topsheet 36 with at least one [piece] portion of the third [groove] grooves 47 having an appropriate length and more preferably with at least two [pieces] portions of the third [groove] grooves 47 each being spaced apart in the longitudinal direction in the crotch region 8 of the cover member 2. Referring to Fig. 8, the absorbent member

3 is formed along each of its transversely opposite side edge portions 29 with a pair of the third [groove] grooves 47 spaced from each other in the longitudinal direction. Taking account of the fact that the presence of the third [groove] grooves 47 tends to, in the same manner as the first [groove] grooves 41 in the embodiment shown by Fig. 4, restrain the absorbent member 3 from being easily curved between the front and rear end portions 26, 27, it is preferred to separate each of the third [groove] grooves 47 in the crotch region 8 so that the absorbent member 3 may be easily curved and thereby facilitated to fit to the wearer's crotch region. Each of the third [groove] grooves 47 preferably has a width of about 2 - 20 mm and a depth corresponding to about 1/4 - 3/4 of the thickness of the core 38. The third [groove] grooves 47 formed in this manner can reduce an amount of body fluids permeated sideways and prevent body fluids from leaking sideways of the diaper 1 by introducing body fluids such as urine to be guided thereinto.

As is apparent from Fig. 10 [showing] which shows the diaper 1 in [the] an enlarged sectional view, the position of the third [groove] grooves 47 substantially conforms to the position of the first [groove] grooves 41 as viewed in the transverse direction of the diaper 1. With the first and third grooves 41, 47 formed in the absorbent member

3 on the side of the backsheet 37 and the side of the topsheet 36, respectively, in such an alignment, the absorbent member 3 [is] can be curved as indicated by imaginary lines in Fig. 10 [and facilitated] to follow a contour of the wearer's waist as the diaper 1 is worn.

5 The first [groove] grooves 41 [is] are deformed with [its width] their widths widened and the third [groove] grooves 47 [is] are deformed with [its] their widths narrowed as the absorbent member 3 follows the contour of the wearer's waist in the waist-surrounding direction. Such deformation of the grooves 41, 47 advantageously [facilitates]  
10 allows the absorbent member 3 to follow the contour of the wearer's waist without the formation of wrinkles on the side of the topsheet 36 even if the core 38 has a thickness of about 10 - 20 mm. Therefore, there is no [anxiety] apprehension that the presence of the topsheet 36 might [give] causethe wearertoexperienceanuncomfortablefeeling.

15 In this way, the first [groove] grooves 41 [serving] which serve to improve the air permeability of the absorbent member 3 [is] are preferably positioned with respect to [that of] the third [groove] grooves 47 so that the [fitness] ability of the absorbent member 3 to fit around the wearer's waist [also] may also be improved. More  
20 specifically, with the [arrangement that the] first [groove] grooves 41 and the third [groove] grooves 47 [are] positioned [on the same

position] with respect to one another as illustrated in Fig. 10, it is preferred to dispose the core 38 between the first and third grooves 41, 47 so that [the] body fluids can be dispersed in the absorbent member 3 in the transverse direction through the core 38.

5           While [this] the present invention has been described herein above with respect to [the] a pants-type disposable diaper as the typical embodiment thereof, [this] the invention is also applicable [also] to an open-type disposable diaper. The cover member 2 may be formed [by] from a nonwoven fabric or plastic film both of which are  
 10 [preferably.] preferable. The core 38 of the absorbent member 3 may be formed [by a] from fluff pulp fibers 61 and superabsorbent polymer particles 62. The superabsorbent polymer particles 62 may be mixed with the fluff pulp fibers 61 and this mixture may be layered in the thickness direction of the core 38. The superabsorbent polymer  
 15 particles 62 may be distributed [with its] so as to have a density that gradually [increasing] increases in [the] a direction that extends from the topsheet 36 toward the backsheet 37. The distribution density of the superabsorbent polymer particles 62 may be varied in the transverse direction of the absorbent member 3. For example, referring  
 20 to Fig. [8,] 9, the distribution density of the superabsorbent polymer particles 62 may be adjusted to be higher in [the] a lower zone of

the absorbent core 38 defined between a pair of the [third] first grooves [47, 47] 41 than in [the zones] an upper zone of the absorbent core 38 located above the lower zone. [extending outside the pair of the third groove 47, 47.] In any case, an amount of the superabsorbent polymer particles 62 used to form the core 38 is preferably about 2 - 98 % by weight of the core 38. Thermoplastic synthetic [fiber] fibers having a melting point of  $100^{\circ}\text{C} \pm 20^{\circ}\text{C}$  may be mixed into the core material up to 20 % by weight to facilitate formation of the first - third [groove] grooves 41, 46, 47 by heating the core 38 under [a] pressure.

The disposable diaper according to this invention has the first [groove] grooves and the second [groove] grooves formed in the absorbent member 38 on the side of the backsheet [of the absorbent member] which is attached to the inner side of the cover member. The grooves contribute to improvement of air permeability of the absorbent member itself as well as to the air permeability [desired] between this absorbent member and the cover member so that no stuffiness may occur even when the absorbent member is closely [contacted] in contact with the wearer's skin.